NASA SBIR/STTR Technologies

H4.02-8749 - Projection/Reflection Heads-up Display

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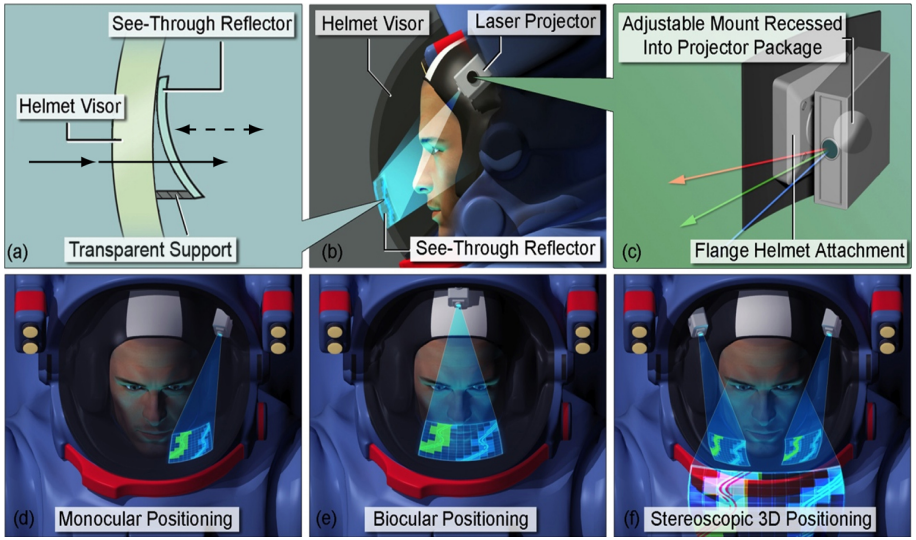
Identification and Significance of Innovation

To address the NASA need for an EVA suit display, Physical Optics Corporation (POC) proposes to develop a new Projection/Reflection Heads-up Display (Pro/Ref-HUD). Th approach incorporates miniature full-color laser light sources and low-profile narrowband reflective, see-through toroid-shaped optics, to meet NASA EVA requirements for displays that are completely decoupled from the user's head and achieve full sunlight readability with automated rapid ambient light response. The Pro/Ref-HUD offers full-color, high-resolution images with large eye relief and fields of view, highly suited to the constraints inside an astronaut's helmet. POC plans to demonstrate the feasibility of the Pro/Ref-HUD system by building and testing a preliminary prototype by the end of Phase I. POC will develop in Phase II a fully functional prototype to demonstrate sunlight readability and SXGA resolution, investigate thermal and radiation issues, and design for extreme operation and storage environments.



Estimated TRL at beginning and end of contract: (Begin: 3 End: 4)

Technical Objectives and Work Plan

Technical Objectives:
Objective 1. Development of the full-color (RGB) Pro/Ref-HUD design by analytical computer modeling and optical ray-tracing.
Objective 2. Demonstration of an aberration-corrected full-color reflector on curved substrate.
Objective 3. Demonstration of the integrated Pro/Ref-HUD system inside a helmet.
Objective 4. Exploration of the commercial scenario for Pro/Ref-HUD optics technology.

Work Plan:
1. Develop System-Level Design for the Proposed Pro/Ref-HUD System
2. Design Pro/Ref-HUD Reflector Optics by Computer Modeling
3. Fabricate Pro/Ref-HUD Reflector Optics on Curved Substrate
4. Develop the Pro/Ref-HUD Image Projection Subsystem
5. Evaluate the Pro/Ref-HUD Electronics Subsystem
6. Demonstrate Integrated Pro/Ref-HUD Concept
7. Explore Commercial Potential
8. Prepare and Submit Reports

NASA Applications

The Pro/Ref-HUD technology will provide new capabilities for astronauts during EVA with a see-through display system that allows them to monitor the conditions around them while being provided visual instructions and direction in a hands-free format. Applications include space walks on the International Space Station (ISS) and harsh-environment training can also be completed with the HUD by providing assistance and navigation for improved safety such as dealing with Martian dust storms.

Non-NASA Applications

Military applications of the Pro/Ref-HUD system will include HUDs for pilots of high-altitude supersonic aircraft. The Pro/Ref-HUD can be used by the Air Force or the Navy and others aboard the current Apache helicopter and the CH-53K heavy lift helicopter under development, offering numerous benefits. Additionally, applications include commercial vehicle HUDs.

Firm Contacts

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